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DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER POLLUTION CONTROL
Carson City Office
333 West Nye Lane
CARSON CITY, NEVADA 89706-0851
(775) 687-4670

WEB: www.state.nv.us

WTS-1A: GENERAL DESIGN CRITERIA FOR RECLAIMED WATER IRRIGATION USE

GENERAL NOTES:

The Nevada Division of Environmental Protection (NDEP) must be contacted whenever the use of reclaimed water is planned in order to determine the appropriate discharge permit and assist the applicant in preparing the design submittal to the Division.

Also, the Nevada Division of Water Resources (775) 687-4380 must be notified of the plan to use reclaimed water in order to address requirements for secondary water rights. The Nevada State Health Division (775) 687-4754 should be consulted to ensure the use of reclaimed water is consistent with all water supply protection requirements. Finally, please be aware that the local government and water purveyor may have rules on reclaimed water usage and should be consulted.

GUIDANCE INTRODUCTION:

Pursuant to NAC 445A.275.1(b), the Nevada Division of Environmental Protection (NDEP) must issue a discharge permit for the use of reclaimed water. Prior to issuing this permit, the Division must conduct a complete review of the plans for the reclaimed water use project. The NDEP requires that the plans be prepared and stamped by a qualified Nevada Registered Professional Engineer. This document was created to assist the applicant in preparing and submitting the required plans.

Content of each individual submittal will vary based on the proposed type of reclaimed water use, so not all items listed in this guidance will apply to a given site. This guidance was organized to cover only existing usages of reclaimed water for irrigation in Nevada. Items that the Division deems a requirement are so marked in the document and items that are simply recommendations are so marked.

Information on any guidance referenced in WTS-1A may be gathered by contacting the Division either by phone or the Internet. This document does not replace best professional judgment in reuse system design and site management. The Division reserves the right to require further information as needed.

Past guidance documents for reclaimed water use (WTS-1, WTS-9, and the outline format), are now effectively replaced by this guidance and WTS- 1B (General Criteria for Preparing an Effluent Management Plan)This guidance is considered a living document, and revisions may be made in the future as changes in reclaimed water permitting dictate.

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APPENDICES:

KEYWORDS

AIR GAP: Generally, the safest method of back flow prevention control. For this document, it is defined to be an unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe conveying potable water to the flood level rim of any container with treated effluent. The Uniform Plumbing Code details the requirements for Air Gaps and enforcement is the role of the local water purveyor and/or health department.

BUFFER ZONE:
NAC 445A.076 defines a buffer zone to be the shortest distance between the boundary of the site being irrigated with reclaimed water and either; **one**, the property line boundary of the site; **two,** a posted public warning sign, or; **three**, any point where the property is open to public access, whichever is least.

DMR: Discharge Monitoring Report. A table-formatted report where results from permit analytical requirements are recorded for submittal to the NDEP.

FECAL COLIFORM:
Bacteria from feces of mammals which is used as an indicator of pathogenic organisms.

RECLAIMED WATER:
Domestic Wastewater that has been treated to secondary treatment standards and disinfected to levels necessary (per NAC 445a.276, 277, and 278) for the chosen method of reuse. Other terms for this water include Treated Effluent, Reuse Water, and Recycled Water.

SAR : Sodium adsorption Ratio, a ratio determined from the concentration (milliequivalents/liter) of sodium, calcium, and magnesium in water. It is used as an indicator of potential soil problems.

$$\text{SAR} = \frac{Na}{[(Ca + Mg)/2]^{1/2}}$$

A modification of this ratio, termed the adjusted SAR, considers the changes in calcium solubility in soil water. The procedure for determining this ratio is listed in Wastewater Engineering Treatment, Disposal and Reuse. 1991.

SOIL LEACHING:
Irrigation practice of applying water to soils in an effort to drive salts beyond the crop root zone. Function of crop salinity tolerance and salt level in irrigation water.

SPRAY IRRIGATION:
Spray irrigation is subdivided into solid set (golf courses), move-stop (wheel lines), and constant move (center pivot) systems.

SURFACE IRRIGATION:
Surface irrigation is subdivided into flood irrigation and drip irrigation. Additionally, flood irrigation is further subdivided into ridge/furrow systems and graded borders.

SITE CHARACTERIZATION DATA

REQUIREMENTS:

A. Maps for Site(s)

1. General location map for the proposed reclaimed water use area that shows any surrounding water courses, all wells or springs on site and within 250 feet of the site boundary. In addition, show any dwelling units on or within 1000 feet of the site.

2. Topographic site map depicting the boundaries of the reuse site(s). The elevation contour intervals should be at least every five feet. All drainage's within and around the site shall be presented on this map. Also, seismic zone information should be provided, if applicable and available.

3. A 100-year flood zone map of the site.

B. Ground Water Information

The groundwater flow direction, gradient, depth below ground surface, and static water level elevation shall be presented from published data or sampling data for the proposed reuse site. Additionally, water quality data that has been collected from wells at or near the site shall be submitted.

C. Soils Data

Soils data to be included in the submittal include soil classifications, infiltration rates, and general soil chemistry as it relates to plant growth. Soil maps from the NRCS (Natural Resource Conservation Service) are a typical source for this type of information.

D. Plant Survey

Provide a list of current vegetation growing at the site.

RECOMMENDATIONS:

E. Boring Logs

The recommended average is one boring per two acres, with a minimum of two logs, and a maximum of five logs for the site. The depth investigated should range from land surface to the groundwater table, or to a predetermined level based on NDEP consultation. Logs should be prepared by a qualified professional. The logs should detail, at a minimum, the presence of confining layers, highly pervious stratum, fractured bedrock, and depth to groundwater.

F. Soil Test Pits

Exploratory soil test pit data from surface to a depth of five feet (minimum of two per site). Items to examine include:

1. Soils Texture - NRCS nomenclature
2. Soil Gradation
3. Hardpan, bedrock, or other aquacludes
4. Gravel lenses, soil mottling
5. Soil Chemistry (pH, EC, Cation Exchange Capacity, ESP, SAR, Boron, Sodium, and Nitrogen).

G. Infiltration Tests

Soil infiltration rates determined from field tests. Pilot scale infiltration basin tests are recommended for determining representative values. The EPA Manual "Land Treatment of Municipal Wastewater" provides the procedure for this test. Appendix Six includes the reference citation for the Manual. Standard percolation tests are also acceptable.

PLANT CHARACTERISTICS

REQUIREMENTS:

A. Plant Information to provide for each plant species:*

1. Evapotranspiration Rate (ET);
2. Annual Nitrogen Uptake (pounds per acre per year);
3. Salinity tolerance;
4. Required rooting depth; and
5. Growing season for the region.

* See Appendix Six for references on determining these requirements

RECOMMENDATIONS:

B. Plant information that is recommended for each plant species:

1. Harvesting requirements;
2. Product Demand (economic benefit of crop);
3. Special nutrient needs, sensitivities;
4. Trace Inorganic demands, sensitivities; and
5. Freeze/drought tolerance.

RECLAIMED WATER QUALITY

REQUIREMENTS:

A. Reclaimed Water Quality Data to Provide

1. BOD and TSS.

   Reuse water must meet secondary treatment standards (NAC 445A.275.2). This is 30 mg/l BOD_5 and 30 mg/l TSS, unless specifically exempt for "treatment equivalent to secondary treatment". Please consult the Division for anticipated permit limits.

2. Fecal Coliform or Total Coliform

   Limits on Fecal Coliform and Total Coliform levels are based on the method of irrigation and site buffer zones as described in NAC 445A.276-278. (Refer to Appendix Seven and specific guidance sections for more details).

3. Nitrogen Speciation

   Nitrogen concentrations and nitrogen forms (Ammonia, nitrate, organic) in the reclaimed water.

RECOMMENDATIONS:

B. Reclaimed Water Quality Data that the Division recommends be evaluated

1. Metals

   Examine the concentrations of metals in the reclaimed water that may be present. Certain metals will inhibit plant growth and may also pose a risk to ground water quality if leached.

2. Sodium Adsorption Ratio

   Check the SAR or Adjusted SAR of the reclaimed water.

3. Significant Inorganics

   Electrical Conductivity, pH, Sodium, Chloride, Boron, Phosphorus, TDS, and other pertinent inorganics as related to plant growth should be evaluated.

DETERMINING THE IRRIGATION BUDGETS

REQUIREMENTS:

A. The NDEP requires that the applicant conduct three distinct irrigation balances for the reuse site during the planning phase. The first two balances, for the plant consumptive use needs and the nitrogen loading limit, are prepared to determine the **optimal reclaimed water application rate** for the plant(s) per the chosen method of irrigation and yet still be protective of ground water quality. The third evaluation considers the effect of soil permeability at the site, and is used for design purposes to help ensure that the site is appropriate for reclaimed water irrigation, and ponding and run-off will not occur.

Depending upon site-specific factors, such as the reclaimed water nitrogen content and the crop's nitrogen uptake rate, one of the two balances (nitrogen loading or consumptive use) will govern for groundwater protection. Since these are best design estimates of safe application rates, the Division's reuse discharge permit instructs the user to prepare annual reports detailing the reasons (crop management goals, changes in turf management, seasonal weather differences, etc.) for exceeding the optimal application rate during any given year.

Example worksheets are included in Appendices One through Three. The first worksheet (1-A, 2-A, and 3-A) in each appendix is a general **annual overview** sheet and can be used to estimate the optimal reclaimed water application volume to determine the limiting use rate. The second worksheet in each appendix (1-B, 2-B, and 3-B) is a breakdown of monthly reclaimed water application rates and can be used for initial design, irrigation planing, and annual reporting. Use of these worksheets as an ongoing management tool would allow the applicant to track and compare design and actual usage rates throughout the year.

When preparing the annual balance report, the third worksheet in the nitrogen evaluation section (Worksheet 2-C) incorporates the addition of commercial fertilizer. This promotes additional awareness and provides general guidance to the user on the necessary adjustments in chemical fertilization practices when using reclaimed water containing nitrogen.

If more than one crop type is used at the site, the crop nitrogen uptake rates and salinity tolerances will vary. Therefore, separate worksheets should be completed for each crop area, and the total reclaimed water usage for the site would be the sum of the usage rates for each crop.

IRRIGATION SYSTEM DESIGN
General Design Items for All Systems

A. Flow Rate Recording

Requirement: Method of flow rate measurement for the site(s). If flow meters are used, the meter placement should be such to allow access for reading and servicing. Plans for reclaimed water screening and/or filtering for accurate recording of flow should be evaluated.

B. Storm water Run-on and Run-off Controls

1. **Requirement**: Plans for routing Storm water run-on around, or through, the site shall be provided. Typical run-off controls include conveyance ditches and perimeter berms. The 25-year, 24-hour storm event shall be used in these designs; and

2. **Requirement**: Storage reservoirs must contain, without release, the precipitation that falls within the reservoir boundaries for the 25-year, 24-hour storm event at the site. Also, the reservoir must withstand, without release of reclaimed water (from structural damage of berms, etc.), the run-off generated from the 100-year, 24-hour storm event at the site. If run-on will impact exterior berms, a method of erosion control shall be implemented.

C. Storage Reservoirs

1. **Requirement**: WTS-37 "Guidance Document for Design of Wastewater Detention Basins" shall be used as the general guidance for the design of the reservoir (pond). Water balances shall be developed for each systems specific requirements (winter storage, etc.).

   The NDEP will evaluate the risk to ground water at the site in determining reservoir lining criteria (such as liner thickness and permeability).

2. **Recommendation**: For reclaimed water use sites where this reuse system is the sole discharge method for a community's reclaimed water, a minimum of four days of storage volume should be available in reservoirs for periods when the reuse irrigation system is not operating. Storage time is intended to allow time for system repairs.

3. **Recommendation**: In designing a storage reservoir, special focus should be given to algae control, filtering outake water, and odor control devices.

D. Notification Signage and Public Access Controls

1. **Requirement**: Reuse areas shall have appropriate notification signs that clearly state that treated effluent is in use, and to avoid body contact with spray. (NAC 445A.275.3). These signs shall be placed along each side of the reuse area at points of public access (such as gates) and at least every 300 feet along a fence line or border, unless otherwise approved by the Division. See Appendix Five for sign examples. Signs should be bi-lingual, english and spanish (or other applicable language), for areas where workers and the public may not speak english.

2. **Requirement**: All ponds containing effluent must be posted with notification signs stating treated effluent is in storage. Signs should be bi-lingual, english and spanish (or other applicable language), for areas where workers and the public may not speak english.

3. **Recommendation**: A continuous fence around the area of reuse is recommended in sites requiring a buffer zone and control of public access during reuse. Buffer zone requirements are defined in NAC 445A.276.

4. **Recommendation:** In the case of nighttime irrigation at areas with the potential for public access at night, signs should be illuminated if possible.

E. Subsurface Drainage , if applicable, these are requirements

If the reuse operation requires subsurface drainage, the plans for the drain need to be prepared and submitted to this office. Discharge options for the subsurface drainage will be dependent on its quality and its final disposition. This may require coordination with the reuse permit writer.

F. Reclaimed water disinfection at reuse site; **if** applicable to meet permit limits, these are requirements

1. Design Drawings of the disinfection system, including system redundancy
2. Design calculations for the dosing, contact time, and other related factors
3. Chemical storage plan
4. Spill containment plan
5. Operation and Maintenance Manual

G. Filtration unit, **if** applicable to meet permit limits, these are requirements

1. Design Drawings for the filter system, including system redundancy.
2. Design calculations for the filter sizing, pumps, and backwash cycle.
3. Plan for backwash disposal.
4. Chemical storage plan.
5. Spill containment plan.

H. Weather Station at site, **if** applicable, these are requirements

1. Location for the weather station shall be depicted on the site map.
2. Description of the operational features of the station, including the station wind speed recorder, precipitation, and ET system.

I. Cross-connection Certification

Requirement: Documentation shall be provided that notification has been made to the local water purveyor and the local health agency of the permittee's intent to use reclaimed water. This documentation shall describe the plan for complying with cross-connection control requirements of the local water purveyor.

IRRIGATION SYSTEM DESIGN

Spray Irrigation Design Submittal Items

REQUIREMENTS:

A. Buffer Zones

1. Delineating the Zone(s)

   Delineate the required buffer zones for the reuse site and how the public will be kept from encroaching into these zones. Buffer zones are a function of the reclaimed water quality and public access controls. NAC 445A.276-277 defines the size of the zone required. The regulation is included in Appendix Seven.

2. Controlling Aerosol Drift

   For sites with buffer zone requirements, aerosol drift must be controlled to prevent the carryover of aerosols outside of sites buffer zones (NAC 445A.275.5). In order to assess the risk of public contact with wind blown aerosol, the prevailing wind direction shall be presented on the site plan. A typical method of controlling aerosol drift involves the use of a weather station with an anemometer which is automated to cease irrigation at target wind speeds.

B. Reuse Water Application Plans

Detailed plans of the irrigation system layout on the reuse site shall be provided. Items to depict are; the location of control valves, drain valves, blow-off valves, air-gaps, flow meters, pumps, and other related items. Detail drawings shall be provided for control valves, pumps, air gaps, flow meters, and other related items.

C. Irrigation Pump System(s)

Design plans for the reclaimed water pump station(s) shall be presented. Relevant items include:

1. Alarm Systems, level sensors, redundancy, spill containment, and back-up power;

2. If potable water is used for seal water, the local water purveyor and/or health authority shall be consulted to examine back flow prevention controls; and

3. Permanent wording stating that reclaimed water is being used should be placed on visible sections of the pump station(s) such as name plates, meters, and valves. This wording should be bi-lingual in areas where the workers do not all speak english.

D. Reclaimed Water Run-off Prevention

In the event of a line break from the irrigation system, surface flow must be prevented from discharging off the site. The design for the surface flow containment system must be based on a conservative estimate of the volume of water from a significant system failure. Some acceptable options are containment berms and collection ditches with conveyance to impoundments.

E. Cross connection control and Potable Water Protection

The guidelines for separation between reclaimed water and potable water lines that are required by the governing health department and/or local water purveyor shall be followed. The Division requires that the reuser provide documentation that the governing health authority has approved the plan(s) for cross connection controls and backflow prevention.

RECOMMENDATIONS:

F. American Water Works Association Guidelines

As a guidance, the Division recommends the following from the American Water Works Association with regards to irrigation system installation:

1. Purple color for all piping, risers, valve controllers, and valve box covers. In lieu of this, other approved methods or marking, such as purple marking tape over the entire pipe length, could be used. Permanent wording stating that treated effluent is being used should be stenciled on all valve box covers, reclaimed water pipe, and other ancillaries. NOTE: Other identification plans, provided that they meet the objectives of preventing cross connection, misidentification and misunderstanding of piping systems could be used;

2. Prohibiting hose bibs on the treated effluent system;

3. Quick coupler fittings should be such that interconnection cannot be made between potable and reclaimed water systems;

4 At crossings with potable lines, the applicable rules dictated by the governing health authority must be followed.

G. Drain Valves

Drain valves should be located at low points on the distribution system to allow reuse water line draining for maintenance and seasonal shut-down of the system. Drain water should be infiltrated on-site.

H. Filter Screens

Filter screens or strainers should be installed on the delivery system to prevent sprinkler clogging from algae or other particulates if it is a problem.

I. Piping Protection

Plastic piping should be protected from sunlight. Openings, such as risers, that may allow rodents to nest should be covered.

IRRIGATION SYSTEM DESIGN

Surface (Flood and Drip) Irrigation Design Submittal Items

REQUIREMENTS:

A. Flood Irrigation Design Items

1. Field Grading.

   The reuse field should be leveled to allow for smooth and even distribution of water over the field. The slope of the grade is dependent on the type of flood irrigation. Graded border irrigation should be conducted on relatively flat lands. Ridge and furrow irrigation should be sloped, around 2%-5%.

2. Method of reuse water application.

   The design plans for reuse water application to the field should be presented. Some common dosing plans include lined ditches with slide gates, slotted pipe, and ridge and furrow systems. The design should focus on even distribution of effluent over the site. Erosion controls at the discharge locations should be incorporated in the design.

3. Tailwater recovery system design.

   Design plans for tailwater containment and return systems should be presented. Sizing of the tailwater system must be based on conservative estimates of the volume of tailwater.

B. Drip Irrigation Design Items

1. System Layout

   The design plans for reuse water application to the site should be presented. This includes the layout for the distribution lines, emitter zones, and design application rates. It is critical that the pressure limits for the distribution system not be exceeded.

RECOMMENDATIONS:

2. Clog Prevention

   Design plans for screening particulate matter, to prevent clogging the emitters, is recommended by the Division.

GROUNDWATER MONITORING

Generally, at least one well located up gradient of the reuse site and two wells located down gradient of the site are required. If groundwater monitoring is required by the permit, proposed monitoring well locations are to be presented on the required site map. The proposed well sites and construction design must receive approval from NDEP prior to installation.

NDEP's WTS-4 "Guidance Document for Monitoring Well Siting" shall be used for the well siting and design process. The Nevada Division of Water Resources must be contacted for necessary permits and any additional design requirements.

The purpose of the monitoring wells are to demonstrate that the use of reclaimed water does not cause the degradation (exceedance of State Drinking Water Standards) of existing or potential underground sources of drinking water. They are recommended where there is a potential for pollutants to be carried into waters of the state by any means. (NRS 445A.490.3., NRS 445A.465.3)

WTS-1A: APPENDIX ONE

PLANT CONSUMPTIVE USE WORKSHEET

The consumptive use equation for determining the crop's water requirement takes into account precipitation, evapotranspiration, the efficiency of the irrigation system, and the salt tolerance of plant species. The salt tolerance of the plant species is used to calculate the leaching requirement (Lr) to remove excess salts from the root zone. Excess salts within the soil cause the plant cells to expend more energy adjusting the salt concentration within the plant tissues, and therefore, less energy is available for vigorous plant growth. The hydraulic loading rate and the TDS to ECw conversion equation included below are derived from Wastewater Engineering: Treatment, Disposal, and Reuse, (Metcalf and Eddy, 1991), the equation for the leaching requirement is from the Nevada Irrigation Guide, (USDA, Soil Conservation Service, 1981).

$$Lw_{(c)} = \frac{(ET-P)}{[E \times (1-Lr)]} \qquad Lr = \frac{ECw}{[(5 \times ECe)-ECw]}$$

where:

- $Lw_{(c)}$ = Allowable Hydraulic Loading Rate Based on Crop Water Needs (in/yr);
- ET = Evapotranspiration Rate (in/yr);
- P = Precipitation Rate (in/yr);
- Lr = Leaching Requirement (%, expressed as a fraction);
- E = Efficiency of Irrigation System (%, expressed as a fraction)
  For example: 75% = 75/100 = 0.75; example efficiencies are included below;
- ECe = Salinity Tolerance of Plant Crop (mmho/cm or dS/m)[(1)];
- ECw = Salinity of Applied Effluent (mmho/cm); If TDS is supplied by the laboratory, see conversion below; and
- TDS = Average Total Dissolved Solids in Applied Effluent (mg/l).

"ET" - Evapotranspiration

Evapotranspiration is defined as the "loss of water from the soil both by evaporation and by transpiration from the plants growing thereon" (Websters Dictionary, 1990). Since different plants transpire at different rates, a crop coefficient (Kc) can be used to modify the potential ET for a particular area. Values for Kc vary depending upon the geographical location of the crop, and the species grown. If a crop coefficient can be determined, when multiplied by the potential ET rate, the result is a more accurate estimate of ET for an irrigation site. The Division recommends that reusers contact local agriculture representatives identified in Appendix Six for further crop-specific and regional information.

"E" - Irrigation Efficiency

The irrigation system efficiency is related to how effective the method is in delivering the irrigation water equally to all parts of the crop. Example values for efficiency are[4]:

Sprinkler Irrigation Type	**Application Efficiency**	**Surface Irrigation Type**	**Application Efficiency**
Solid Set	0.70 - 0.80	Narrow Graded Border (< 15' wide)	0.65 - 0.85
Portable Hand Move		Wide Graded Border (<100' wide)	0.65 - 0.85
Wheel Roll		Level Border	0.75 - 0.90
Center Pivot or Traveling Lateral		Straight or Graded Contour Furrows	0.70 - 0.85
Traveling Gun		Drip	0.70 - 0.85

"ECe" - Salinity Tolerance of Plant Crop

The plant salt tolerance is crop-specific, and can be obtained from the local Extension Service, literature, or other reputable sources. The low end of the range identifies the ECe value which would result in a 0% reduction of crop yield. The upper end of the range identifies the ECe value which could result in a 25% reduction of crop yield[4].

Example ECe's:

Annual Ryegrass[2] = 3 to 6 mmho/cm or dS/m
Perennial Ryegrass[2,4] = 5.6 to 8.9 mmho/cm or dS/m
Bermudagrass[2,4] = 6.9 to 10.8 mmho/cm or dS/m
Tall Fescue[2,4] = 3.9 to 8.6 mmho/cm or dS/m
Alfalfa[3,4] = 2.0 to 5.4 mmho/cm or dS/m

"ECw" - Salinity of Applied Effluent

Direct measurement of ECw is typically preferred. However, if the laboratory has supplied the reuser with a concentration of TDS, an approximate conversion[4] is ECw ≈ TDS ÷ 640. This conversion is considered accurate within 10%. The value for ECw or TDS is obtained from the treatment plant supplying the effluent. For site design, an average value can be used. For completion of the required annual balance report, the actual analytical results from Discharge Monitoring Reports should be used.

(1) For clarity in this document, the unit for electrical conductivity (EC) is expressed as mmho/cm. However, EC can also be expressed in decisiemens per meter, dS/m.
1 mmho/cm = 1 dS/m

(2) Wastewater Reuse for Golf Course Irrigation, US Golf Association, 1994.

(3) Nevada Irrigation Guide, USDA Soil Conservation Service, 1981.

(4) Wastewater Engineering: Treatment, Disposal, and Reuse, (Metcalf and Eddy, 1991)

Worksheet 1-A

CONSUMPTIVE USE REQUIREMENT WORKSHEET:
Maximum Loading Rate Based on Plant Water Use Requirements
Page _____ of _____ Crop Type = _____

$Lw_{(c)} = \frac{(ET-P)}{[E \times (1-Lr)]}$; $Lr = \frac{ECw}{[(5 \times ECe)-ECw]}$; $ECw \approx TDS \div 640$

(A) Annual Evapotranspiration (ET, in/yr) = _____
(Multiply by Crop Coefficient (Kc) if value is known)

(B) Annual Precipitation (P, in/yr) = _____
(C) (A) - (B) = _____ (in/yr)

(D) Salinity of Applied Effluent (ECw, mmho/cm) or ≈ (TDS, mg/l) ÷ 640 = _____
(Indicate which method was used to determine ECw, Direct Measurement or Approximation by Calculation.)

(E) Salinity Tolerance of Plant Crop (ECe, mmho/cm) = _____
(F) 5 x (E) = _____ (mmho/cm)
(G) (F) - (D) = _____ (mmho/cm)
(H) Leaching Requirement (Lr, %, expressed as a fraction) = (D) ÷ (G) = _____

(I) 1 - (H) = _____
(J) Efficiency of Irrigation System (E, %, expressed as a fraction) = _____
(K) (J) x (I) = _____

(L) (C) ÷ (K) = $Lw_{(c)}$ = _____ (inches/year)

If the Water Use Rate calculated in ("L") above is the lowest application volume calculated for the annual Consumptive Use Limit (This Worksheet), the Nitrogen Limit (Worksheet 2-A) or the Permeability Limit (Worksheet 3-A), then fill out Worksheet 1-B to estimate the planned maximum daily flow for the site.

Worksheet 1-B

CONSUMPTIVE USE REQUIREMENT WORKSHEET:
Maximum Loading Rate Based on Plant Water Use Requirements
Page _____ of _____ Crop Type = _____

$Lw_{(c)} = \frac{(ET-P)}{[E \times (1-Lr)]}$; $Lr = \frac{ECw}{[(5 \times ECe)-ECw]}$; $ECw \approx TDS \div 640$

Monthly values for evapotranspiration are dependent on the crop type and regional area of the site, as well as the crop coefficient if known. Monthly precipitation is also regional. The values for ET and P can be obtained from the local extension service, literature, or other reputable source. Please see the explanation in the "WTS-1A: Appendix One" text for further discussion of crop coefficients.

To calculate the monthly value for $Lw_{(c)}$, perform the calculation for each month as outlined in Worksheet 1-A, and input the result in the table below. Since this form is crop-specific, a value of zero is acceptable when the crop is not in season; however, use of a zero should be explained.

Million Gals/Mo = $Lw_{(c)}$ in/mo x _____ ac ÷ 12 in/ft x 43,560 ft^2/ac x 7.481 gals/ft^3 ÷ 1,000,000
(Enter and use the number of acres for the crop type being irrigated)

MGD (Million gallons/day) = M Gallons/mo ÷ Days/mo

Month	Days/Mo	ET (in/mo)	P (in/mo)	$Lw_{(c)}$ (in/mo)	M Gals/Mo	MGD
Jan	31					
Feb	28					
Mar	31					
Apr	30					
May	31					
Jun	30					
Jul	31					
Aug	31					
Sep	30					
Oct	31					
Nov	30					
Dec	31					
Totals (in/yr):					Note: These totals should approximate the annual values calculated in Worksheet 1-A	

WTS-1A: APPENDIX TWO

NITROGEN LOADING LIMIT WORKSHEET

The nitrogen loading equation takes into account precipitation, evapotranspiration, plant nitrogen uptake, nitrogen content of the applied effluent, and allowable percolate nitrogen concentration. The equation included below is from Wastewater Engineering: Treatment, Disposal, and Reuse, (Metcalf and Eddy, 1991)

$$Lw_{(n)} = \frac{[(Cp, mg/l) \times (P\text{-}ET, in/yr)] + [(U, lb/acre\text{-}yr) \times (4.4)]}{[(1\text{-}f) \times (Cn, mg/l)] - (Cp, mg/l)}$$

where:

$Lw_{(n)}$ = Allowable Hydraulic Loading Rate Based on Nitrogen Loading rate (in/yr);
Cp = Total Nitrogen Concentration in Percolating Water (mg/l);
ET = Evapotranspiration Rate (in/yr);
P = Precipitation Rate (in/yr);
U = Nitrogen Uptake Rate by Crop (lb/acre-yr);
4.4 = Combined Conversion Factor;
Cn = Total Nitrogen Concentration in Applied Wastewater (mg/l); and
f = Fraction of Applied Total Nitrogen Removed by Denitrification and Volatilization.

"Cp" - Nitrogen in Percolating Water

A conservative value for Total N in the water that percolates past the root zone (Cp) is 7 mg/l, which is the first "red flag" value for Nitrate as N in monitoring well samples. Setting the Cp limit at a constant value aids in obtaining an hydraulic nitrogen loading rate ($Lw_{(n)}$) which should be protective of groundwater resources. The drinking water standard for Nitrate as N is 10 mg/l, which would be the maximum allowable value for Cp.

"ET" - Evapotranspiration

Evapotranspiration is defined as the "loss of water from the soil both by evaporation and by transpiration from the plants growing thereon" (Websters Dictionary, 1990). Since different plants transpire at different rates, a crop coefficient (Kc) can be used to modify the potential ET for a particular area. Values for Kc vary depending upon the geographical location of the crop, and the species grown. If a crop coefficient can be determined, when multiplied by the potential ET rate, the result is a more accurate estimate of ET for an irrigation site. The Division recommends that reusers contact local agriculture representatives identified in Appendix Six for further crop-specific and regional information.

"U" - Crop Nitrogen Uptake

Plant nitrogen uptake rates (U) are crop-specific, and can be obtained from the local Extension Service, literature, or other reputable sources. Using the accepted value for U in this equation assumes that the harvested portion of the crop is removed from the site. If plant cuttings are not removed from the area, then the amount of nitrogen removed by uptake should be offset by the amount of nitrogen returned to the soil by decomposing cutting materials. If alfalfa, or another legume, is the site's crop, then similar considerations should be made for atmospheric nitrogen which is fixed into the soil by alfalfa. A discussion with the local agricultural extension service is recommended prior to finalizing a "U" value.

"Cn" - Nitrogen in Applied Wastewater

The total nitrogen in the applied effluent water (Cn) can be obtained from the treatment plant that is supplying the effluent. For site design, an average value can be used. For completion of the required annual balance report, the actual analytical results from Discharge Monitoring Reports shall be used.

"f" - Nitrogen lost to Denitrification and Volatilization

The amount of nitrogen lost to denitrification and volatilization varies depending upon the nitrogen characteristics of the applied wastewater and the microbial activity in the soil. Microbial denitrification, in soils with a sufficient carbon source for the biological activity, may account for as much as 15 to 25 percent of the applied nitrogen during warm, biologically active months. Volatilization of ammonia may be as much as 10 percent, depending upon the ammonia fraction in the total nitrogen applied. (Metcalf & Eddy, 1991) For arid climates, such as Nevada, the value typically used for the "f" term is 0.2.

Nitrogen Addition by Chemical Fertilizers

If the allowable reuse water application volume is limited by plant consumptive use (Worksheet 1-A), nitrogen may need to be added by commercial fertilizer. In the design of a reuse site, this should be estimated to provide the site operator with a guideline for fertilizer application, in addition to the nitrogen being applied via the treated effluent. The application of fertilizer must then be incorporated into the required annual report to demonstrate that the application of commercial nitrogen and effluent nitrogen did not exceed the plant crop's uptake rate.

Worksheet 2-C is designed to be used to provide the Division with the required annual report of effluent and fertilizer usage. Worksheet 2-C can also be utilized as a site management tool to *estimate* the amount of commercial fertilizer which may be required in an upcoming month. However, use of the worksheet in this manner does not preclude the responsible use of good irrigation and nutrient management practices.

Worksheet 2-A

WATER REQUIREMENT DESIGN WORKSHEET:
Maximum Hydraulic Loading Rate Based On Annual Nitrogen Balance Evaluation
Page _____ of _____ Crop Type = _____

$$Lw_{(n)} = \frac{[Cp \times (P-ET)] + (U \times 4.4)}{[(1-f) \times Cn] - Cp}$$

(A) Total Nitrogen in Percolating Water (Cp, mg/l) = _____

(B) Annual Precipitation (P, in/yr) = _____

(C) Annual Evapotranspiration (ET, in/yr) = _____
(Multiply by Crop Coefficient (Kc) if value is known)

(D) (B) - (C) = _____ (in/yr)

(E) (A) x (D) = _____

(F) Crop Nitrogen Uptake (U, lb/ac-yr) = _____

(G) (F) x 4.4 = _____

(H) (E) + (G) = _____

(I) Fraction of Applied Total Nitrogen Lost to Denitrification and Volatilization (f) = _____

(J) 1- (I) = _____

(K) Total Nitrogen in Applied Effluent (Cn, mg/l) = _____

(L) (J) x (K) = _____

(M) (L) - (A) = _____

(N) (H) ÷ (M) = $Lw_{(n)}$ (inches/year) = _____

If the Water Use Rate calculated in ("N") above is the lowest application volume calculated for the annual Consumptive Use Limit (Worksheet 1-A), the Nitrogen Limit (This Worksheet) or the Permeability Limit (Worksheet 3-A), then fill out Worksheet 2-B to estimate the planned maximum daily flow for the site.

Worksheet 2-B

WATER REQUIREMENT DESIGN WORKSHEET:
Maximum Hydraulic Loading Rate Based On Annual Nitrogen Balance Evaluation
Page _____ of _____ Crop Type = _____

$$Lw_{(n)} = \frac{[Cp \times (P-ET)] + (U \times 4.4)}{[(1-f) \times Cn] - Cp}$$

Monthly values for evapotranspiration are dependant on the crop type and regional area of the site, as well as the crop coefficient if known. Monthly precipitation is also regional. The values for ET and P can be obtained from the local extension service, literature, or other reputable source. Please see the explanation in the "WTS-1A: Appendix Two" text for further discussion of crop coefficients.

The monthly value of crop nitrogen uptake (U) can be calculated according to the equation included on the Table. Please see the discussion in the "WTS-1A: Appendix Two" text regarding "U" values for alfalfa crops or sites that do not remove crop cuttings. If a different distribution of monthly "U" is used, due to circumstances such as germination or dormancy periods, then provide documentation explaining the difference.

To calculate the monthly value for $Lw_{(n)}$, perform the calculation for each month as outlined in Worksheet 2-A, using the monthly values for "U", "P", "ET", and "Cn", and input the result in the table below. Since this form is crop-specific, a value of zero is acceptable when the crop is not in season; however, use of a zero should be explained.

Monthly U (lb/ac-mo) = U (lb/ac-yr) x ET(in/mo) ÷ ET (total in/yr)

Million Gallons Per Month = $Lw_{(c)}$ in/mo x _____ (ea. crop type) # acres ÷ 12 in/ft x 43,560 ft^2/ac x 7.481 gallons/ft^3 ÷ 1,000,000

MGD (Million gallons/day) = M Gallons/mo ÷ Days/mo

Month	Days/Mo	P (in/mo)	ET (in/mo)	U (lb/ac-mo)	$Lw_{(n)}$ (in/mo)	M Gals/Mo	MGD of Reclm'd Water
Jan	31						
Feb	28/29						
Mar	31						
Apr	30						
May	31						
Jun	30						
Jul	31						
Aug	31						
Sep	30						
Oct	31						
Nov	30						
Dec	31						
Totals:						Note: The totals for P, ET and $Lw_{(n)}$ should approximate the annual values used or calculated in Worksheet 2-A	

Worksheet 2-C: *Regardless of the limiting hydraulic loading rate that was defined during the design phase, Worksheet 2-C is designed to be used to provide the Division with the required annual report of effluent and fertilizer usage.*

Effluent N Applied = _____ x _____ (mg/l) x 8.34 x _____ ÷ _____ x
(lb/ac-mo) MGD Applied Effluent N Conc. # days/mo # Acres (1 -"f") (i.e. 0.2.)

Fertilizer N Applied = _____ Monthly Fertilizer used (lbs/mo) x _____ % N in Fertilizer (as a fraction) ÷ _____ acres
(lb/ac-mo)

Crop Name and Nitrogen Uptake Requirement = _____, _____ (lbs/ac-yr)

Month	Days/Mo	Million Gallons Applied (mo)	MGD of Irrigation Water Applied	Effluent N Concentration (mg/l)	Effluent N Applied (lb/ac-mo)	Fertilizer N Applied (lb/ac-mo)	Total N Applied (Effl. N + Fert. N) (lb/ac-mo)
Jan	31						
Feb	28/29						
Mar	31						
Apr	30						
May	31						
Jun	30						
Jul	31						
Aug	31						
Sep	30						
Oct	31						
Nov	30						
Dec	31						
						Total** =	

** The Total N Applied to the crop should be less than the crop's Nitrogen Uptake Requirement. Please see your permit for directions if it is not.

WTS-1A: APPENDIX THREE

PERMEABILITY LIMIT WORKSHEET

The equation for the hydraulic limit based on soil permeability takes into account precipitation, evapotranspiration, and the design percolation rate of the soil. The equation below is from: Wastewater Engineering: Treatment, Disposal, and Reuse (Metcalf and Eddy, 1991).

$$Lw_{(p)} = ET - P + Wp$$

where:

$Lw_{(p)}$ = Allowable Hydraulic Loading Rate Based on Permeability (in/yr);
ET = Evapotranspiration Rate (in/yr);
P = Precipitation Rate (in/yr); and
Wp = Design Percolation Rate (in/yr), Based on a Percentage (2%-6%) of the Minimum Soil Profile Permeability.

"ET" - Evapotranspiration

Evapotranspiration is defined as the "loss of water from the soil both by evaporation and by transpiration from the plants growing thereon" (Websters Dictionary, 1990). Since different plants transpire at different rates, a crop coefficient (Kc) can be used to modify the potential ET for a particular area. Values for Kc vary depending upon the geographical location of the crop, and the species grown. If a crop coefficient can be determined, when multiplied by the potential ET rate, the result is a more accurate estimate of ET for an irrigation site. The Division recommends that reusers contact local agriculture representatives identified in Appendix Six for further crop-specific and regional information.

"Wp" - Design Percolation Rate

As noted above, the design percolation rate (Wp) should be reduced to 2% to 6% of the minimum soil permeability. This is a conservative approach, and accounts for variation in soil permeabilities across the site, as well as variations within the soil column.

Worksheet 3-A

MAXIMUM DESIGN HYDRAULIC LOADING RATE:
Based on Annual Permeability Evaluation
Page _____ of _____ Crop Type = _____

$Lw_{(p)} = ET - P + Wp$

(A) Annual Evapotranspiration (ET, in/yr) = _____
(Multiply by Crop Coefficient (Kc) if value is known)

(B) Annual Precipitation (P, in/yr) = _____

(C) Design Permeability (inches/hour) = _____

(D) (C) x _____ hr/day x 365 days/yr = inches/year = _____
(Enter and use anticipated average time of irrigation in hours per day, i.e. 10 hrs/day)

(E) % used for Percolation Reduction (typically 2% to 6%, expressed as a fraction) = _____

(F) Design Percolation Rate (Wp, in/yr) = (D) x (E) = _____

(G) (A) - (B) + (F) = $Lw_{(p)}$ (inches/year) = _____

This site evaluation tool is to be used to provide awareness to the site developer that soil permeability may be a concern at the site and that a plan (soil amendments, application rates, etc.,) may have to be developed to prevent excessive ponding.

Site location and method of reuse will be the major factors in determining the level of this plan. Contact your NDEP reviewer for assistance.

Worksheet 3-B

MAXIMUM DESIGN HYDRAULIC LOADING RATE:
Based on Annual Permeability Evaluation
Page _____ of _____ Crop Type = _____

$Lw_{(p)} = ET - P + Wp$

Monthly values for evapotranspiration are dependant on the crop type and regional area of the site, as well as the crop coefficient if known. Monthly precipitation is also regional. The values for ET and P can be obtained from the local extension service, literature, or other reputable source. Please see the explanation in the "WTS-1A: Appendix Three" text for further discussion of crop coefficients.

To calculate the monthly value for $Lw_{(p)}$, perform the calculation for each month as outlined in Worksheet 3-A, and input the result in the table below.

Million Gals/Mo = $Lw_{(c)}$ in/mo x _____# acres (ea. crop type) ÷ 12 in/ft x 43,560 ft^2/ac x 7.481 gals/ft^3 ÷ 1,000,000

MGD (Million gallons/day) = M Gallons/mo ÷ Days/mo

Month	Days/Mo	ET (in/mo)	P (in/mo)	$Lw_{(p)}$ (in/mo)	M Gals/Mo	MGD
Jan	31					
Feb	28					
Mar	31					
Apr	30					
May	31					
Jun	30					
Jul	31					
Aug	31					
Sep	30					
Oct	31					
Nov	30					
Dec	31					
Totals (in/yr):					Note: These totals should approximate the annual values calculated in Worksheet 3-A	

APPENDIX FOUR

WORKER HYGIENE FACT SHEETS

This project area uses reclaimed wastewater for irrigation. This reclaimed wastewater comes from the sewage treatment plant and meets the standards required for this level of reuse. Potential risks of disease transmission from the use of the reclaimed water is low, however, some general guidelines (listed below), should be followed protect you from becoming ill when working with reclaimed water:

1. Do not drink the reclaimed water or use the reclaimed water for washing.

2. Always wash hands and face with clean water and soap before eating, smoking, or drinking.

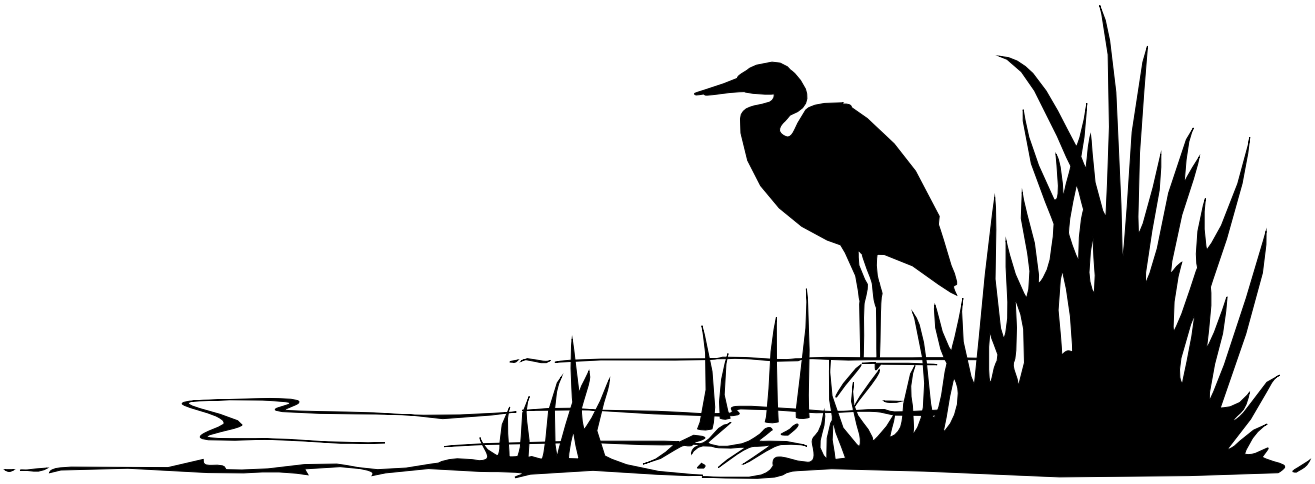
3. Wear rubber gloves when working on the irrigation system.

4. Try to keep the irrigation water off your skin and clothes as much as possible.

5. Always treat cuts immediately before continuing with work on the irrigation system.

6. Make sure the area is clear of people that may get sprayed before running the irrigation system.

7. Report any problems to your supervisor that you feel could pose a risk.

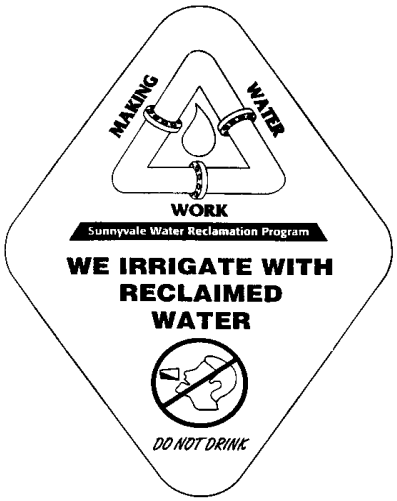


APPENDIX FIVE

NOTIFICATION SIGN EXAMPLES

IRRIGATION SIGN

Figure 4.3



IRRIGATION SIGN

Figure 4.4

IRRIGATION SIGN

Figure 4.5

APPENDIX SIX

REUSE REFERENCE LISTS

LITERATURE REFERENCE LIST FOR RECLAIMED WATER USE MANAGEMENT

1. "Guidelines for Using Disinfected Recycled Water", Awwa California-Nevada Section, 1997 & 1984.

2. "Guidelines for Water Reuse", U S Environmental Protection Agency, 1992.

3. "Land Treatment of Municipal Wastewater", U S Environmental Protection Agency, 1981.

4. "Nevada Irrigation Guide", US Department of Agriculture, Soil Conservation Service, 1981.

5. Wastewater Reuse For Golf Course Irrigation, US Golf Association, 1994, Lewis Publishers.

6. Water Reuse Manual of Practice, Water Environment Federation 1989.

7. Wastewater Engineering Treatment, Disposal and Reuse, Metcalf & Eddy, 1991, Mcgraw-hill Publishers.

8. Irrigation with Reclaimed Municipal Wastewater- A guidance manual. G.S. Pettygrove and T. Asano, 1985, Lewis Publishers.

Contact List for Technical and Regulatory Guidance

1. **Nevada Division of Environmental Protection, Bureau of Water Pollution Control**
   333 West Nye Lane, Carson City, NV, 89706.....(775) 687-4670

2. **Nevada Division of Water Resources**
   123 West Nye Lane, Carson City, NV 89705.....(775) 687-4380

3. **Nevada Division of Health**
   505 East King Street, Carson City, NV 89710 .....(775) 687-4750

4. **Desert Research Institute**
   7010 Dandini Boulevard, Reno, NV 89506.....(775) 673-7300

5. **National Resource Conservation Service (NRCS)**
   1528 U.S. Highway 395, Minden, NV 89410.....(775) 883-2623

   5301 Longley Lane, Building F, Room 201, Reno, NV 89511 .....(775) 784-5875

6. **University of Nevada Cooperative Extension**
   2345 Redrock Street, Suite 100, Las Vegas, NV 89146-3160 .....(702) 222-3130

7. **U.S. Agriculture Department**
   920 Valley Road, Reno, NV 89512 .....(775) 784-6057

8. **Center for Urban Water Conservation - UNLV Dept. of Biology**
   Las Vegas, Nevada 89157-4004 .....(702) 895-3853

APPENDIX SEVEN

NEVADA ADMINISTRATIVE CODE - REUSE REGULATIONS

Use of Treated Effluent for Irrigation

445A.275 General requirements and restrictions.

1. A person shall not use treated effluent for irrigation unless he has:
   (a) Submitted to the division and has received the approval of the division of a plan for the management of effluent; and
   (b) Obtained a permit pursuant to NAC 445A.228 to 445A.263, inclusive.

2. A person using treated effluent for irrigation by flooding or sprinklers shall use effluent that has received at least secondary treatment. As used in this subsection:
   (a) "Secondary treatment" means that the biological oxidization of the sewage to a point where the sewage has a 5-day inhibited biochemical oxygen demand concentration of 30 milligrams per liter or less.
   (b) "Five-day inhibited biochemical oxygen demand" means the amount of dissolved oxygen in milligrams per liter required during stabilization of the carbonaceous decomposable organic matter by aerobic bacterial action at 20 degrees centigrade for 5 days.

3. Any person using treated effluent for irrigation shall post a notice at the site of irrigation warning the general public to avoid contact with the treated effluent.

4. Except as otherwise provided in this subsection, a person shall not use treated effluent to irrigate crops for human consumption. A person may use treated effluent for surface irrigation of fruit bearing trees and nut bearing trees.

5. A person using treated effluent to irrigate by sprinklers shall conduct the irrigation in a manner which inhibits the treated effluent from drifting or carrying outside the buffer zone.

6. A person shall not allow treated effluent used in irrigation to run off the site being irrigated.

(Added to NAC by Environmental Comm'n, eff. 9-13-91)--(Substituted in revision for NAC 445.176)

Reviser's Note.

The regulation of the state environmental commission filed with the secretary of state on September 13, 1991, the source of NAC 445A.275 to 445A.280, inclusive, became effective on that date and contains the following provisions not included in NAC:

"Notwithstanding the provisions of sections 2 to 8, inclusive, of this regulation, a person who:

1. Is using treated effluent for irrigation on the effective date of this regulation without having obtained a permit pursuant to NAC 445A.228 to 445A.263, inclusive; and
2. Has submitted to the state department of conservation and natural resources a completed application for obtaining a permit pursuant to NAC 445A.228 to 445A.263, inclusive, within 180 days after the effective date of this regulation,

may continue to use treated effluent for irrigation without having obtained a permit until the state department of conservation and natural resources takes action upon the application for a permit."

445A.276 Spray irrigation: Requirements for bacteriological quality and buffer zone limitations.

1. Treated effluent being used for spray irrigation must meet the following requirement for bacteriological quality and buffer zone limitations:

	Fecal Coliform c.f.u or mpn/100 ml			
R Reuse Permitted	A	A(1)	B	C
3 30-day geometric mean	No limit	200	23	2.2
Maximum daily number	No limit	400	240	23
Minimum Buffer Zone (Feet)	800	400	100	0

2. As used in this section:

(a) Category "A" means irrigation with treated effluent of land used for:

(1) Pasture; or

(2) Other agricultural purposes except growing crops for human consumption, where public access to the site being irrigated is prohibited.

Treated effluent being used for activities falling within category A must meet the requirements for bacteriological quality and buffer zone limitations identified in subsection 1 as applicable to category A or meet the requirements for bacteriological quality and buffer zone limitations identified in subsection 1 as applicable to category A(1).

(b) Category "B" means irrigation with treated effluent for land used for:

(1) A golf course, cemetery or greenbelt where public access to the site being irrigated is controlled and human contact with the treated effluent does not occur;

(2) An impoundment where all activities are prohibited and human contact with the treated effluent does not occur; or

(3) Any combination of a use listed in paragraph (a) and a use listed in subparagraph (1) or (2) of this paragraph.

Treated effluent being used for activities falling within category B must meet the requirements for bacteriological quality and buffer zone limitations identified in subsection 1 as applicable to category B.

(c) Category "C" means irrigation with treated effluent of land used for:

(1) A cemetery, highway median, greenbelt, park, playground or residential or commercial lawn where public access to the site being irrigated is controlled and human contact with the treated effluent cannot reasonably be expected;

(2) Impoundments where full body contact with the treated effluent cannot reasonably be expected;

(3) Any other purpose not included in category A or B; or

(4) Any combination of an activity listed in paragraph (a) or (b) and an activity listed in subparagraph (1), (2) or (3) of this paragraph.

Treated effluent being used for activities falling within category C must meet the requirements for bacteriological quality and buffer zone limitations identified in subsection 1 as applicable to category C.

(d) "C.f.u. or mpn/100 ml" means colony forming units or most probable number per 100 milliliters of the treated effluent.

(Added to NAC by Environmental Comm'n, eff. 9-13-91)--Substituted in revision for NAC 445.1765)

445A.277 Exceptions to requirements for buffer zone and control of public access. A buffer zone and control of public access is not required where treated effluent is used for irrigation of land used for a cemetery, golf course, greenbelt, impoundment where full body contact can reasonably be expected, park, playground or commercial or residential lawn, if the treated effluent:

1. Has a total coliform concentration of 2.2, or less, per 100 milliliters of the treated effluent as a 30 day geometric mean; and
2. Has a total coliform concentration of 23, or less, per 100 milliliters of the treated effluent as a maximum daily number.

(Added to NAC by Environmental Comm'n, eff. 9-13-91)--(Substituted in revision for NAC 445.177)

445A.278 Drip or surface irrigation of landscape: Minimum level of disinfection. The minimum level of disinfection for drip irrigation of landscape and surface irrigation of landscape with treated effluent in areas where public access is controlled is 200 fecal coliform per 100 milliliters of the treated effluent as a 30 day geometric mean and 400 fecal coliform per 100 milliliters of the treated effluent as a maximum daily number.

(Added to NAC by Environmental Comm'n, eff. 9-13-91)--(Substituted in revision for NAC 445.1775)

445A.279 Determining quality of effluent: Storage reservoirs excluded from treatment process. For the purpose of determining the quality of effluent, storage reservoirs do not constitute part of the treatment process.

(Added to NAC by Environmental Comm'n, eff. 9-13-91)--(Substituted in revision for NAC 445.178)

445A.280 Waiver or modification of requirements. The director may waive compliance with or modify any requirement of NAC 445A.275 to 445A.280, inclusive, for a specific project of irrigation upon his determination that because of the size, type or location of the project of irrigation, the wavier or modification is consistent with the policy set forth in NRS 445A.305.

(Added to NAC by Environmental Comm'n, eff. 9-13-91)--(Substituted in revision for NAC 445.1785)